

✓

THE
LONDON, EDINBURGH, AND DUBLIN
PHILOSOPHICAL MAGAZINE
AND
JOURNAL OF SCIENCE.

CONDUCTED BY

SIR OLIVER JOSEPH LODGE, D.Sc., LL.D., F.R.S.
SIR JOSEPH JOHN THOMSON, O.M., M.A., Sc.D., LL.D., F.R.S.
ALFRED W. PORTER, D.Sc., F.R.S.

AND

JOHN R. AIREY, M.A., D.Sc., Sc.D.

“Nec araneorum sane textus ideo melior quia ex se fila gignunt, nec
noster vilior quia ex alienis libamus ut apes.”

JUST. LIPS. *Polit. lib. i. cap. 1. Not.*

VOL. XXI.—SEVENTH SERIES.

JANUARY—JUNE 1936.

LONDON:

TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

Agents: WM. DAWSON & SONS, LTD., CANNON HOUSE, PILGRIM ST., E.C. 4.

“Meditationis est perscrutari occulta ; contemplationis est admirari
perspicua Admiratio generat quæstionem, quæstio investiga-
tionem, investigatio inventionem.”—*Hugo de S. Victore.*

—— “ Cur spirent venti, cur terra dehiscat,
Cur mare turgescat, pelago cur tantus amaror,
Cur caput obscura Phœbus ferrugine condât,
Quid toties diros cogat flagrare cometas,
Quid pariat nubes, veniant cur fulmina cœlo,
Quo micet igne Iris, superos quis conciat orbes
Tam vario motu.”

J. B. Pinelli ad Mazonium



CONTENTS OF VOL. XXI.

(SEVENTH SERIES).

NUMBER CXXXVIII.—JANUARY.

	Page
Mr. R. M. Davies on the Determination of the Dielectric Constants of Organic Liquids at Radio Frequencies.—Part I. Carbon Tetrachloride and Chloroform	1
Messrs. H. Lessheim and R. Samuel on the Dissociation of some Molecules with Free Valencies	41
Dr. R. H. Evans and Mr. R. H. Wood on Modulus of Elasticity of Materials for Small Stresses	65
Mr. A. Fage on Turbulent Flow in a Circular Pipe	80
Messrs. L. Chitty and A. J. S. Pippard on the Stresses in a Disk Wheel under Loads applied to the Rim	106
Prof. Louis V. King on the Electrical and Acoustic Conductivities of Cylindrical Tubes bounded by Infinite Flanges	128
Dr. Edmund C. Stoner on the Temperature Dependence of Free Electron Specific Heat	145
Sir Joseph Larmor on Optical Relativity as tested by Rotational Quality	160
Mr. I. T. Pierce and Dr. R. W. Roberts on Photographic Measurements of the Magnetic Rotatory Dispersion of Water	164
Dr. J. Monteath Robertson on Numerical and Mechanical Methods in Double Fourier Synthesis	176
Mr. R. H. Healey on the Influence of the Radiation Field from an Electrical Storm on the Ionization Density of the Ionosphere .	187
Notices respecting New Books :—	
Messrs. A. Campbell and E. C. Childs's The Measurement of Inductance, Capacitance, and Frequency	199
Messrs. A. H. Compton and S. K. Allison's X-Rays in Theory and Experiment	200

NUMBER CXXXIX.—FEBRUARY.

Prof. R. V. Southwell on the Notion of Generalized Plane Stress ..	201
Dr. H. T. Gonin on the Use of Factorial Moments in the Treatment of the Hypergeometric Distribution and in Tests for Regression.	215
Dr. N. L. Yates-Fish on the Rotation of Dipoles in Elastic and Viscous Media	226
Dr. E. A. Stewardson on the Pressure Dependence of Unimolecular Reactions	233
Dr. Ralph Cooper and Mr. John Todd on the Large Roots of $\cos z = az + c$	249
Mr. H. J. Walke on the Atomic Weight of Element 93	262
Prof. S. Koizumi: Notes on the Asymptotic Evaluation of Operational Expressions	265
Dr. W. Fabian on Fractional Calculus: Fractional Contour Integration	274
Dr. W. T. David on Temperature and Latent Energy in Flame Gases	280

	Page
Dr. I. A. Balinkin on Transverse Vibrations of Long Rods	283
Dr. C. D. Niven on the Hume-Rothery Conception of the Metallic State	291
Mr. W. H. Ingram on an Electro-Magnetic Inertial Ellipsoid associated with the Windings of Electrical Machinery.....	299
Mr. J. C. Costello on Bessel Product Functions	308
Notices respecting New Books :—	
Professors S. Timoshenko and G. H. MacCullough's Elements of Strength of Materials	319
Mr C. F. Meyer's The Diffraction of Light X-rays, and Material Particles	320

NUMBER CXL.—FEBRUARY (SUPPLEMENT).

Mr. R. G. Wood and Dr. S. H. Ayliffe on a Method for determining the Optical Constants of Crystals and Examples of its Application to certain Organic Compounds	321
Prof. E. Taylor Jones on the Mutual Energy in Systems of Vibrating Particles, and a Suggestion regarding Electrostatic Energy	337
Mr. N. Ganguli on Magnetic Studies on Graphite and Graphitic Oxides	355
Dr. B. J. O'Kane on the Application of Debye's Theory of Polar Molecules to Solid Dielectrics	369
Mr. W. T. Howell on Electromagnetic Waves from a Point Source.	384
Dr. R. Roscoe on the Plastic Deformation of Cadmium Single-Crystals	399
Mr. Samuel C. Curran on an Apparent Regularity in β -ray Reflexion	406
Mr. Forrest F. Cleveland on Magnetic Forces in a Rectangular Circuit	416
Dr. N. W. McLachlan and Mr. A. L. Meyers on the Ster and Stei Functions.	425
Dr. N. W. McLachlan and Mr. A. L. Meyers on Integrals involving Bessel and Struve Functions.	437
Dr. Zirô Tuzi and Mr. Masataka Nisida on Photo-elastic Study of Stresses due to Impact	448
Dr. David Robertson on Subsidiary Whirling of Rotors due to Speed Oscillation	474
Mr. J. Shearer on Wave-length Measurements in the K-Series of Aluminium, Sulphur, and Chlorine, and in the L-Series of Zinc.	501
Dr. R. A. Houstoun on Variations in Colour Vision and Colour Measurement.....	505
Mr. T. L. Ibbs on the Thermal Conductivity of Carbon Dioxide.	508
Notices respecting New Books :—	
Mr. Burton W. Jones's A Table of Eisenstein-reduced Positive Ternary Quadratic Forms of Determinant ≤ 200	510
Messrs. A. Weissberger and E. Proskauer's Organic Solvents : Physical Constants and Methods of Purification.....	511

NUMBER CXLI.—MARCH.

Dr. W. Davies on the Catalytic Combustion of Methane.—Part I..	513
Dr. K. Mendelssohn and Miss J. R. Moore on Experiments on Supraconductive Tantalum	532
Dr. Harold Jeffreys on Asymptotic Solutions of Linear Differential Equations	544

Mr. Manohar Ray on Application of Bessel Functions to the Solution of Problem of Motion of a Circular Disk in Viscous Liquid.	546
Mr. F. Tavani on Light and Gravitation.	564
Mr. E. T. Hanson on Probability in Wave Mechanics.	572
Dr. S. Ramachandra Rao and Mr. K. C. Subramaniam on Magnetic Susceptibility of Single Crystals of Lead, Thallium, and Tin	609
Mr. V. M. Falkner on a Method of Numerical Solution of Differential Equations	624
Mr. H. G. Baerwald on the Distribution of Temperature in a Cylindrical Conductor electrically heated <i>in vacuo</i> .	641
Messrs. F. D. Greeves and J. E. McF. Johnston on the Glow Discharge through Oxygen	659
Dr. L. L. Bircumshaw and Mr. G. D. Preston: Studies on the Oxidation of Metals.—Part III. The Kinetics of the Oxidation of Molten Tin	686
Mr. T. M. MacRobert on Derivation of Legendre Function Formulae from Bessel Function Formulae	697
Prof. Alfred W. Porter on the Calculation of Surface Tension from Experiment	703
Mr. J. T. Combridge on Gauss's Theorem in General Relativity—a Correction.	708
Notices respecting New Books:—	
Annals of Science: a Quarterly Review of the History of Science since the Renaissance. Vol. I. No. 1	709
Messrs. E. V. Condon and G. H. Shortley's The Theory of Atomic Spectra	710
Mr. P. A. M. Dirac's The Principles of Quantum Mechanics.	711

NUMBER CXLII.—APRIL.

Mr. G. D. Preston and Dr. L. L. Bircumshaw on the Effect of Heat Treatment on the Structure of Gold- and Silver-leaf	713
Mr. W. R. Dean: Note on the Slow Motion of Fluid.	727
Dr. S. Tomotika on the Transverse Vibration of a Square Plate clamped at Four Edges	745
Mr. V. R. Coles on Numerical Solution of an Integral Equation.	760
Dr. F. G. Maunsell on Stresses in a Notched Plate under Tension.	765
Mr. J. Harding on the Absorption of Monochromatic Light in Iodine Vapour.	773
Dr. G. W. Brindley on the Atomic Scattering Factors of Aluminium, Nickel, and Copper for $\text{CuK}\alpha$ Radiation and their Relation to the Theory of X-ray Dispersion	778
Dr. G. W. Brindley on an X-ray Investigation of Atomic Vibrations in Zinc	790
Prof. E. A. Owen and Dr. E. L. Yates on X-ray Measurement of the Thermal Expansion of Pure Nickel.	809
Mr. H. G. Hopkins on the Surface Structure of Polished Cleavage Faces of Calcite.	820
Dr. A. F. Stevenson: Correction to my Paper, "On the Theoretical Determination of Earth Resistance from Surface Potential Measurements"	829
Notices respecting New Books:—	
Early Science in Oxford.—Vol. X. The Life and Work of Robert Hooke (Part IV.).	830
Prof. S. S. Bhatnagar and Dr. K. N. Mathur's Physical Principles and Applications of Magnetochemistry	831

NUMBER CXLIII.—MAY.

Mr. H. G. Baerwald on some Relations between Transient Phenomena in Systems with Similar Frequency Characteristics.....	833
Prof. G. B. Bandopadhyaya and Mr. A. T. Maitra on Absorption of Soft X-rays in Aluminium	869
Mr. B. Davison on the Steady Two-Dimensional Motion of Ground-Water with a Free Surface	881
Mr. B. Davison on the Steady Motion of Ground-Water through a Wide Prismatic Dam	904
Dr. George Green on Ring and Disk Sources.....	922
Dr. George Green on a Fundamental Problem in Diffraction.....	934
Messrs E. Z. Stowell and A. F. Deming on the Dual Nature of Modulation	947
Prof. Iturô Uhara on the Theoretical Calculation of Normal Potential of Metals and Henry Constant of Ions	958
Prof. Robert Cameron Colwell on Concealed Systems and Relativity.	976
Messrs. A. G. Warren and R. G. Friend on the Effect of a Magnetomotive Force applied for a short time to a Steel Cylinder	980
Mr. J. L. Sharma on Lamé's Equation.....	991
Dr. N. A. V. Piercy and Mr. J. H. Preston on a Simple Solution of the Flat Plate Problem of Skin Friction and Heat Transfer....	995
Mr. J. C. Costello: Note on the Bending of Rectangular Plates....	1005
Mr. R. M. Davies on the Determination of the Dielectric Constants of Organic Liquids at Radio Frequencies.—Part II. Chlorobenzene and Ethylene Dichloride	1008
Notices respecting New Books:—	
Messrs. M. N. Saha and B. N. Srivastava's A Treatise on Heat.	1029
Dr. Harold Jeffreys's Earthquakes and Mountains	1030
Royal Meteorological Society: some Problems of Modern Meteorology	1031

NUMBER CXLIV.—JUNE.

Dr. D. G. Bourgin on Interference Calculations and Wave Groups.	1033
Dr. John Thomson on a new Polarization Effect in Discharge-Tubes	1057
Prof. K. C. Kar on the Spontaneous and Artificial Transmutations of Atom Nuclei	1067
Mr. A. Colin Woodmansey on Atomic Weights by Calculation ...	1079
Prof. S. C. Dhar on Operational Representations of Confluent Hypergeometric Functions and their Integrals	1082
Mr. W. A. Tuplin on the Effect of Changes in a Torsionally Vibrating System on the Natural Frequencies of the System ...	1097
Mr. K. V. Sastry on a Generalization of the Lorentz Transformation	1111
Dr. R. A. Houstoun on the Characteristic Curve of the Photographic Plate.....	1113
Mr. Akshayananda Bose on Magnetic Susceptibilities of Organic Substances in Different Physical States	1119
Mr. G. G. Paldhikar on Maxwell Effect in Liquids	1125
Dr. J. H. Lees on Cesium-Oxygen Films on Tungsten	1131
Mr. J. W. Belton on the Physical Significance of Activity Coefficients in Reversible Electrode Equilibria	1140
Notices respecting New Books:—	
Messrs. L. Pauling and E. B. Wilson's Introduction to Quantum Mechanics.....	1144
Prof. C. J. Keyser's Mathematics and the Question of the Cosmic Mind	1145
Index	1146

P L A T E S.

- I. Illustrative of Dr. J. Monteath Robertson's Paper on Numerical and Mechanical Methods in Double Fourier Synthesis.
 - II. Illustrative of Mr. S. C. Curran's Paper on an Apparent Regularity in β -ray Reflexion.
 - III.—IX. Illustrative of Dr. Z. Tuzi and Mr. M. Nisida's Paper on Photo-elastic Study of Stresses due to Impact.
 - X. Illustrative of Messrs. F. D. Greeves and J. E. McF. Johnston's Paper on the Glow Discharge through Oxygen.
 - XI. Illustrative of Dr. L. L. Bircumshaw and Mr. G. D. Preston's Paper on Studies on the Oxidation of Metals.—Part III. The Kinetics of the Oxidation of Molten Tin.
 - XII. Illustrative of Mr. G. D. Preston and Dr. L. L. Bircumshaw's Paper on the Effect of Heat Treatment on the Structure of Gold- and Silver-leaf.
 - XIII. & XIV. Illustrative of Mr. H. G. Hopkins's Paper on the Surface Structure of Polished Cleavage Faces of Calcite.
 - XV. & XVI. Illustrative of Dr. G. B. Bandopadhyaya and Mr. A. T. Maitra's Paper on the Absorption of Soft X-rays in Aluminium.
-

ERRATA.

In No. 140 (Feb. Suppl. 1936), p. 366, in Table II. :—

<i>For</i> Naphthalene.....	—41	—187	146	15
<i>read</i> Naphthalene	—55	—169	114	11
<i>For</i> Anthracene.....	—49	—273	224	16
<i>read</i> Anthracene	—69	—252	183	13
